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Lorraine Staehr

La Trobe University

Graeme Shanks

University of Melbourne

Peter Seddon

University of Melbourne

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ACIS 2002 Proceedings. 7.
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Analysing ERP Use with the Structural Model of Technology

^aLorraine Staehr, ^bGraeme Shanks and ^bPeter Seddon

^aDepartment of Information Technology
La Trobe University
Bendigo, Australia
l.staehr@bendigo.latrobe.edu.au

^bDepartment of Information Systems
University of Melbourne
Melbourne, Australia

Abstract

The post implementation period of an ERP implementation in an Australian manufacturing organisation is examined with the aim of understanding and explaining the business consequences that occurred. The description of the case is followed by an analysis using the structural model of technology. The radical change in the way users needed to understand the business in terms of the new system, coupled with insufficient training and support post implementation, and user resistance to change, impacted on the benefits the organisation gained from the system.

Keywords

Structuration theory, software packages, change management, case study

INTRODUCTION

Enterprise Resource Planning (ERP) systems are large software packages that provide an integrated environment based on an enterprise wide data model with a set of software applications that allow processing of all the data of the organisation (Bancroft *et al.*, 1996). Despite collective investment by organisations worldwide in ERP systems in the order of billions of dollars (Stein, 1999), many organisations do not know if they have achieved a positive return on their investment. Few studies have looked at the post implementation period of ERP systems to determine how and why business benefits evolve over time. Of those that have (Shang and Seddon, 2000; Markus and Tanis, 2000), neither study has examined the post implementation phase of ERP implementation in a manufacturing organisation in detail over time to determine its influence on business benefits in the longer term. It is of significant interest to senior management of organisations, IS practitioners and IS academic researchers to know more about the post implementation period of ERP systems, the business benefits that result during the period, and how and why these consequences occurred.

ERP systems have been studied from a number of different perspectives. These include project management, outsourcing, organisational knowledge, large packaged software, critical success factors for implementation, and business benefits, to name a few (Esteves and Pastor, 2001). In this study ERP implementation and use is viewed from the perspective of organisational change (Boudreau and Robey, 1999; Davenport, 2000). The post implementation period of an ERP implementation in an Australian manufacturing organisation is examined with the aim of understanding and explaining the business consequences that occurred. The structural model of technology (Orlikowski, 1992) is used as the lens through which the post implementation period is analysed. A number of researchers have either used or proposed the use of structuration theory to understand ERP implementation and/ or use (Boudreau and Robey, 1999; Chae, 2001; Pozzebon, 2001; Volkoff, 1999). The structural model of technology (Orlikowski, 1992), was used by Volkoff (1999) to analyse the implementations of ERP systems in two organisations. The research reported in this paper is part of a larger study that aims to understand and explain how and why some organisations gain more business benefits from their ERP systems than others. The outcomes from this paper are limited since the structural model of technology has been used to analyse ERP use in only one organisation.

The paper is organised into three main sections. The first section outlines the theoretical background, followed by a description and interpretation of the case using the structurational model of technology, and finally a discussion and conclusion section.

THEORETICAL BACKGROUND

Structuration theory (Giddens, 1984) provides a lens to analyse social systems but it does not explicitly mention information technology. The structurational model of technology (Orlikowski and Robey, 1991; Orlikowski, 1992; Orlikowski, 2000) bridges this gap and provides a model based on Giddens's structuration theory that IS researchers can use to analyse the development, implementation and use of information technology within organisational settings.

In this research the structurational model of information technology is used to understand and explain the business consequences of ERP use in a single organisation. Since the structurational model of technology is an emergent process theory (Markus and Robey, 1988; Orlikowski and Robey, 1991; Walsham and Han, 1991), it is a suitable theory to use for an empirical study examining the interaction of context and process over time.

A brief account of structuration theory (Giddens, 1984) is necessary as it underpins the structurational model of technology. There are three dimensions of institutionalised social structure in organisations: signification, legitimation and domination. It is important to note that this institutionalised social structure consists of rules and resources that exist only in the human actors' minds. There are also three dimensions of human action: communication, power and sanctioning of conduct. The dimensions of institutional social structure are produced and reproduced over time by the dimensions of human action. This interaction between structure and human action is called the 'duality of structure' and it produces changing interpretive schemes, is affected by resources and may either establish new norms of behaviour or reinforce old ones.

Routinisation of social activity is an important aspect of human action in structuration theory and describes/ explains the difficulty of getting people to act differently. Walsham and Han (1991) call this fixity of social conduct. In other words there is a tendency for humans to exhibit habitual behaviour, the behaviour they already know and are comfortable with, and consequently they exhibit a natural resistance to change.

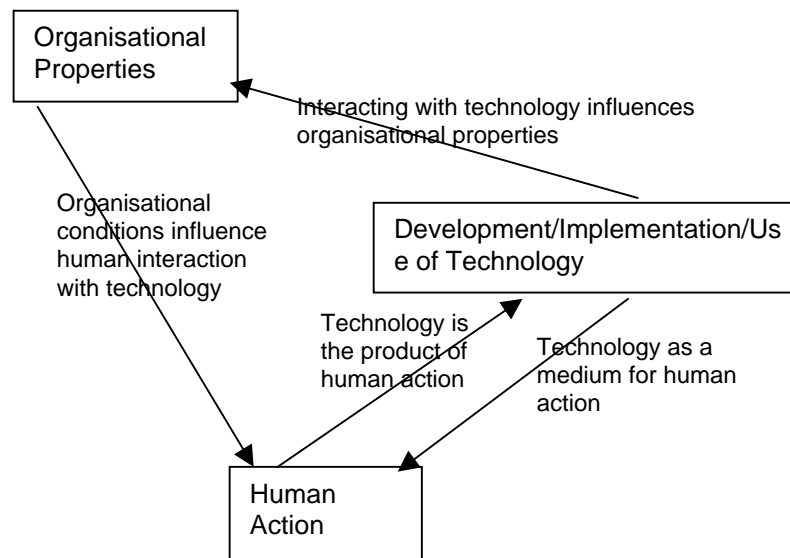


Figure 1: The structurational model of technology (adapted from Orlikowski (1992))

In the structurational model of technology (Orlikowski and Robey, 1991; Orlikowski, 1992; 2000), shown in Figure 1, the technology plays an intermediary role between the organisational properties in the form of social structure, and human action. The development, implementation and use of technology supports and/ or changes the three modalities: interpretive schemes, resources and norms. It may enforce new interpretive schemes by producing new ways for human actors to understand their work. It provides

specific material resources, and the way it has been implemented (its configuration) may change authoritative resources redistributing power and establishing new norms for human action. Orlikowski (1992) proposes a “duality of technology” since technology is developed and altered by human action yet it is used by human actors to achieve some purpose. Another important aspect of technology is that it is interpretively flexible in development, implementation, and use. The technology, as a product of human action is not fixed in a particular configuration from the outset but there are many choices to be made during the development process with different associated outcomes. Some software (e.g. ERP systems) is also interpretively flexible during implementation as extensive configuration and customisation is possible as part of the implementation process. Likewise the use of technology is interpretively flexible in that there are different ways that it may be used, influenced by both organisational properties and human actors. Technology therefore both enables and constrains human action and there will be both intended and unintended outcomes from its development, implementation and use.

THE CASE STUDY

An interpretive case study approach was taken. Full details of the research design can be found in Staehr *et al.* (2002). Data was collected between February and November 2001. The primary source of data collection was from face to face in-depth semi-structured interviews with eight key informants chosen because of their position within the organisation. Interviewees included a member of senior management, the IT manager, two business representatives on the ERP implementation team, three business unit managers and a business analyst. All interviewees (except one) had been employed by the organisation for at least 2 years prior to the ERP implementation. Interviews were tape recorded, transcribed and returned to interviewees for checking to ensure accuracy. To provide triangulation other sources of data collected were company documentary evidence, for example, annual reports, company newsletters etc.

A description and interpretation of the case study using the structural model of technology (Orlikowski and Robey, 1991; Orlikowski, 1992; 2000) follows. This is organised in three main parts, background information concerning the case study organisation, the SAP system planning and implementation, and the use of the SAP system. Although the use of the SAP system is of primary interest, a deeper understanding can be gained by examining the historical and contextual organisational factors that preceded its use.

Background

ManA is a publicly owned Australian company employing around 9,000 staff across approximately 30 countries and with revenue of \$A4 billion annually. It was one of the first companies in Australia to implement an ERP system. In the early 1990s ManA had legacy systems that needed replacing due to increasing problems with maintenance, and the looming year 2000 problem. Some systems, for example, inventory, were 14 years old. At this stage the company had only a small shared service capability, within IT and Finance. A need was seen for an integrated system, various ERP systems were evaluated, and SAP was the system chosen. ManA intended to ensure its four Divisions were operating at the leading edge of information technology (IT) and planned to use IT as a basis for improved customer service.

The implementation of SAP throughout the organisation was used as an enabler of structural change. The limited IT and Finance shared service capability was expanded to include other functional areas e.g. engineering. However, the shared services are implemented as separate instances of SAP for each Division. In ManA SAP was implemented one Division at a time with the last implementation going live in June 2001. The company is also supporting different versions of SAP although it is planned to have all Divisions on version 4.6 in the next 6-8 months (as at August 2001). The organisation as a whole has spent more than \$100 million over time on its SAP implementations. As one of the first Australian companies to implement SAP its staff with SAP experience were in high demand. They were offered very high salaries that ManA did not match, and expertise was lost.

The case entity is a consumer products business (BrandX), making up about three-quarters of the Consumer Products (CP) Division in ManA. BrandX itself consists of a number of

different businesses with sites geographically dispersed in Australia and New Zealand. The individual businesses are referred to as A, B, C, etc. in this paper.

The “go-live” date was 4 months before the introduction of the GST in Australia. As the products were to attract the Goods and Services Tax (GST) this meant that there was an unusually high demand immediately prior to the introduction of the GST in July 2000 and a corresponding drop in demand in the 6 to 12 months after the introduction of the GST. BrandX has also had to respond to a changing retail landscape that is moving towards larger retail stores at the expense of small independently run stores. This has had an impact on distribution and the channels that are used to sell the products. The current state of the IT industry means that CP has only 60% full time IT staff and the shortfall is made up with 40% contract staff. This allows some flexibility according to varying need.

SAP System Planning and Implementation

The influence of the organisational properties of ManA in the form of material resources on the BrandX implementation was evident from the start. BrandX did not evaluate ERP systems for use in its businesses but followed the other Divisions within ManA who were all using SAP (2 in Figure 2). There is evidence to suggest that SAP was not the best choice from the point of view of manufacturing in BrandX.

...Early in 97 my team recognised that the software that we had wasn't going to get us to class A in the MRP II project and we looked at five different software alternatives of which SAP was one and I've got to say that it wasn't my preferred option. That was my recommendation to the executive at the time but [ManA] as we were then had previously made the decision to go to SAP...

(Logistics and Planning Manager, Business B, BrandX)

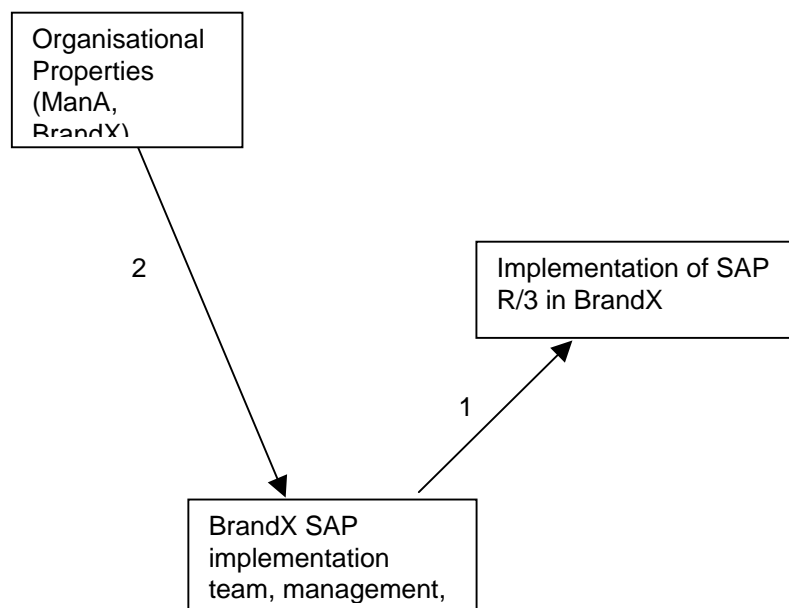


Figure 2: The configuration and customisation of SAP R/3 for BrandX

The organisational properties of ManA in the form of authoritative resources (2 in Figure 2) also influenced the composition of the BrandX SAP implementation team. ManA had used SAP as an enabler of structural change in its move to expand its shared service capability. This required staff reductions that occurred during the implementation process. The choice of business representatives for the SAP implementation team was used to facilitate some reductions in staff. Instead of using the very best business people, second and third level staff was chosen with the knowledge that after implementation they would no longer have a job within the company. The following quote outlines the unintended consequences of this course of action:

...By taking people from the business and putting them there, yes, you share a bit of knowledge but you also carry across bad practices because if a person is doing a job today and is comfortable with the way they are doing it and you then go and configure your SAP to mirror what you've done, what you've done is you've taken an existing process without reengineering, without doing a BPR, and therefore your bad habits get configured and personally I've actually seen this happen.

(Business Improvement Manager, Financial Shared Services, ManA)

SAP was implemented through the human agency of the BrandX implementation team (1 in Figure 2). The technology, in this case the SAP software, is the filter through which understanding of the business and its processes must be viewed by users post implementation. The way the SAP software is configured can shape new structures of signification. Old ways of viewing the business can impact on how the SAP system is configured in the implementation process and therefore ultimately affect the benefits from its use. The SAP software is interpretively flexible, that is, it is possible to configure the software to suit the existing business processes of the organisation or alternatively the claimed "best practices" of the software can be used to improve the organisation's business processes. For the BrandX implementation there was no reengineering and the best practices of the existing businesses within BrandX were implemented. This meant that business processes were standardised across BrandX. However the consequences of implementing the existing business processes may limit the benefits obtained from the software as the following quote testifies:

What we did was we said, no, no, no the software has to change to fit the current process. Whether our process is right or not that's what we know so that's what we are going to do. So in essence if the process was wrong all that SAP enabled us to do is do the wrong things more quickly, which was, it's a bit of a cynical view I know, but ideally when you are implementing software you get your processes right before you get the software put in place so that you can take advantage of the software early on.

(Logistics and Planning Manager, Business A, BrandX)

The BrandX implementation team was influenced by the organisational properties of ManA in the form of material resources (2 in Figure 2), that is, by the consultants on the team with experience in other SAP rollouts in the organisation. Unfortunately this experience with previous implementations in ManA involved businesses very different from BrandX. Some of the existing knowledge and norms the consultants had about SAP implementations in ManA (1 in Figure 2) were not appropriate when it came to the BrandX implementation because the BrandX businesses were so different from the businesses in the other Divisions of ManA.

...The consumer business is very, very different to the rest of [ManA]. It is a totally different business because it's a consumer product business and it's got retail, it's just the sheer size and volume of its customer base, its supplier base and its manufacturing processes are so different to the rest of the organisation.

(Business Improvement Manager, Financial Shared Services, ManA)

As indicated in the quote above, the sheer volume of data differentiated BrandX from the other Division businesses. For example, the other Divisions might deal with 500 large dollar value sales per week while BrandX dealt with 15,000 smaller dollar value transactions per week. The unusually large number of stock keeping units (10,000) also proved to be a problem for the SAP software.

The numbers on the project team varied according to need during the various stages of the project, but the core team consisted of 58 people. It was an advantage to have business representatives on the project team who were empowered to make decisions (2 in Figure 2) as this saved time. There was consultation with business management and users who were

not on the project team when necessary, especially during the “as is” phase of the implementation.

The SAP system was implemented on time, within budget, and with the original scope. It was therefore considered successful. It was a comprehensive “big bang” implementation (Parr and Shanks, 2000) and the “go-live” date was 28 February 2000. Although it was claimed that the SAP implementation was for business reasons it is interesting to note that the implementation was approached as a systems replacement. The software was tailored to match existing business processes, that is, there was no re-engineering prior to the implementation. The rationale was to take the best practices of the businesses in BrandX and implement those. There is evidence to suggest that this translated into the biggest getting the most say. One small business within the Division felt that it did not get the support of the SAP implementation team before implementation due to its small size. It was not a “vanilla” implementation as the project required extensive customisation of SAP (code changes) in the Production Planning area. This customisation was driven by one of the larger businesses within the Division (2 in Figure 2) through the human agency of the BrandX SAP implementation team (1 in Figure 2). The BrandX SAP implementation team was disbanded three months after the “go-live” date.

The type of training users required varied between the functional units of the businesses. For example, users in finance had previously worked with Windows based systems and the transition for them was not as great as in other areas. In contrast, in the distribution area, a deliberate effort was made to ease the transition for operators. The SAP input screens were modified to mimic the screens from the legacy system. This was an attempt to bridge the transition from the old interpretive schemes of the legacy system to the new interpretive schemes required by SAP. These customised interfaces were extremely beneficial for users but presented problems when hot packs (software patches) needed to be installed, and will of course be a continuing problem with upgrades.

The rules and norms brought by some members of the implementation team from their experience in other ManA SAP rollouts was not helpful due the vastly different nature of the BrandX businesses (2 in Figure 2). There was also a perception that the rules and norms of the larger businesses within BrandX were given more say in the implementation of the existing “best practice” business processes.

The decisions made prior to and during the implementation process are important as they can affect the benefits gained from ERP systems (Markus and Tanis, 2000). When SAP is configured using existing business processes, as the case in BrandX, this may also limit the benefits gained from its use. The SAP software, configured and customised by the BrandX implementation team (1 in Figure 2), provided new interpretive schemes that required users to have a new understanding of the business and its processes and a new way of communicating about their daily tasks.

Use of the SAP system

The first month after “go-live” went relatively smoothly. This was because the old system had been used to forecast production for the first month of operation of the new SAP system. It took six months for the old historical data to be loaded onto the new system. Problems with Production Planning meant that only 30-40% of the volume required was manufactured and it took 12 months to overcome these problems. Insufficient stock was available for Christmas 2000 period (9 months after “go-live”).

There were credit and collection problems due to the financial shared services enabled by SAP. For example, if an invoice was out one item it had to be sent from Head Office 2,000 kilometres away for verification and adjustment and then sent back before the invoice could be paid. This required a high level of communication and explanations between BrandX and its suppliers. These problems persist to some extent.

There were performance problems and it took 9 months and a couple of hardware upgrades before this was resolved. The structures of signification (knowledge of the work being automated) brought by the SAP consultants with experience in other ManA implementations contributed to this problem (2 in Figure 2). The lack of understanding of how different the

BrandX businesses were from the businesses in other ManA Divisions contributed to the hardware being unable to cope with the large volume of data.

There were repercussions due to narrowly focussed training and users' lack of understanding of the impact of their mistakes in a highly integrated system. The material resources in the form of change management and training were not adequate in embedding the new structures of signification required by users to do their work effectively.

...I think the post SAP implementation was where we were lacking. What we really didn't do enough of was say how it linked to the job and how the job linked to the wider organisation and that if you make a mistake here are the ongoing implications downstream or if there is an issue with your business this is what could have caused it from before... Someone before you is actually putting data in.

(IT Manager, CP Division)

These new structures of signification affect all users as comprehension of the new interpretive schemes provided by SAP impacts on how well they are able to interact and communicate with colleagues in the work place (5 in Figure 3):

...The people who have been around for while understood, thought they understood how the whole thing worked and now all of a sudden bang they are right back down to kindergarten level with everyone else and they have got the baggage of having the old system still in their mind while trying to operate an entirely different new system.

(Materials Manager, Business B, BrandX)

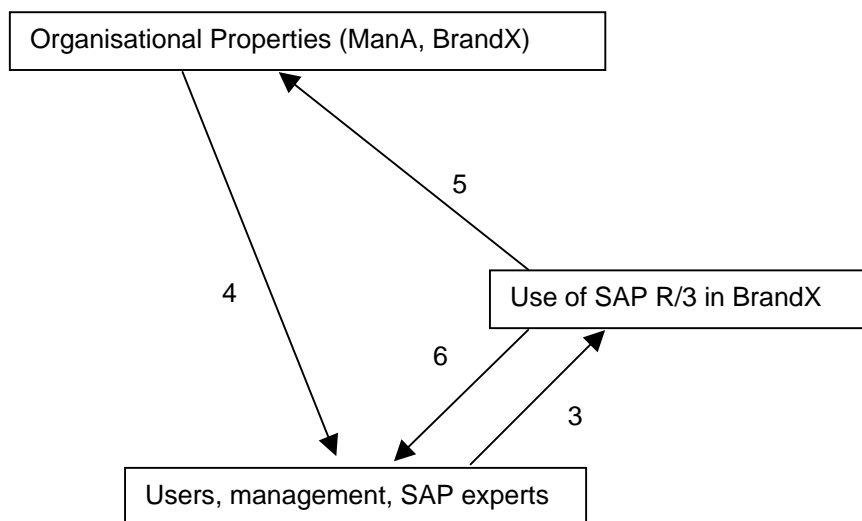


Figure 3: Use of SAP R/3 in BrandX

The SAP system with its new rules and resources threatened the security of employees by the changes required in work place roles (6 in Figure 3):

I guess our people felt really insecure in their roles. The change was so huge that people felt inadequate in their jobs and they felt threatened by the change.

(Materials Manager, Business B, BrandX)

The training that was provided prior to implementation apparently did little to allay the anxiety the users experienced in coping with the SAP software.

Organisational conditions influence human interaction with, and reactions to the technology (4 in Figure 3). The material resources provided for change management, training and support had an impact on the benefits BrandX gained from use of the SAP software. Basic training was provided for users before the system went live, but the relevance of this training

was questioned in some areas. The information in the training system was not “real” in terms of BrandX’s data and it was not possible to do very much with it to see and understand what the new system would be like. Also it was expected that users would supplement the training sessions by finding time to spend in the training environment during their normal working hours. When the system went live there was on site support for only a two week period at the largest manufacturing site. This was clearly felt to be inadequate as the following quote indicates:

The system support was for the start-up period and it was here on-site. We had a person looking after the purchasing side of things and one from the production scheduling and a couple of support staff from ManA who had already gone live with SAP in previous years. They were on site for about two weeks. They probably needed to be on site for 12 months... There was system support through telephones etc. but if you can imagine the amount of phone calls that were going through etc. etc. etc. We regularly obviously advised that we needed to have support on the shop floor, you know to help people manage through the change... So we had support over the phone but that is less than acceptable to be honest.

(Materials Manager, Business B, BrandX)

It took this site until 18 months after “go-live” before they got a ManA SAP expert on site to help with some major problems that they had with the system. However, it is interesting to note that this need not have been the case. Members of the BrandX SAP implementation team had noted early in the implementation process that BrandX would no longer be dependent on internal IT expertise, and that SAP expertise would not only be available within the company but would be readily available from outside the company. However, organisational properties in the form of existing structures of legitimisation influenced this site from going outside the company to acquire SAP expertise, as it was not officially sanctioned conduct.

In the customer service area there is evidence of the impact of insufficient training and support post implementation i.e. the lack of material resources, on the way the system is used (4 in Figure 3):

...I get very frustrated when you put in manual band-aids when the system will fix an issue... They have put in a manual system where the girls have to key in the plant that they want the order to come from. Not how it should be done. We can exclude that material... They don’t know, they are not using the system properly because they do not know how to use it properly. A lot of the benefits from these things is knowing the system.

(Customer service representative on the SAP implementation team, BrandX)

The quote above illustrates one example of the SAP system being used in an unintended and inefficient way. Previous research has shown that these practices quickly become routine and therefore difficult to change as time goes by (Tyre and Orlikowski, 1994). This indicates that insufficient training and support post implementation is holding back the realisation of benefits from the SAP system for BrandX.

The input error rate is high and rework costs are high. A global benchmarking survey of 256 companies showed that ManA’s incoming error input rate was very high compared to others around the world. At one site in BrandX there has been an increase of half to one staff in the warehouse area to ensure data quality (5 in Figure 3). In the customer service area the cost of having better information from the system has meant that the input time for orders has increased slightly but with no change in staff requirements. However less staff are required in the production planning area. Both financial and inventory cycle times have been reduced but there has been no manufacturing cycle time reduction due to SAP. The most noticeable productivity gains have been made in the finance area but this has been largely due to the expansion of financial shared services. The use of the SAP software has had an impact on organisational properties by directly influencing the number of staff i.e. material resources required in different functional areas (5 in Figure 3).

There has been no IT cost reduction at the CP Division level although there may have been cost reductions at higher levels in ManA. This is due to the high cost of SAP contractors and the dependence of the CP Division on them for approximately 40% of IT staff.

The authoritative resources provided by the SAP software brought a new visibility and accountability to users of the system at BrandX (6 in Figure 3).

...It forces accountability...with SAP because it's integrated you actually see the impact of your actions almost instantly. ...It's made people more accountable because there's transparency in what happens. ...You have somebody like a warehouse person who'd never worry about dollars before becomes a bit more aware of that

(Business Improvement Manager, Financial Shared Services, ManA)

Authoritative resources reinforce systems of domination through changes in power relations made possible by the new technology. The integration provided by the SAP software meant that users could no longer hide mistakes as their work impacted almost immediately in other areas of the business. As a finance business representative on the SAP implementation team remarked “*factory people cannot keep secrets about problems in production*”. The previous structures of domination in BrandX were extended by SAP resulting in increased management control. This “informating” aspect of information systems was first observed and defined by Zuboff (1988) and was also reported by Sia *et al.* (2002) in the study of an ERP system in a hospital.

Although use of an ERP system can be considered mandatory (Pozzebon, 2000), this is not true for all tasks and one example is management reporting. Although it is acknowledged in BrandX that there is better information available for decision making it is not generally felt that this is being taken advantage of at this stage. One of the reasons may be the difficulty of overcoming the effects of routinisation that can obstruct the introduction of new ways of doing work. The introduction of financial shared services enabled by and implemented prior to SAP, meant that in many cases managers and users although reluctant, were forced to use the system to produce their own reports because the person who had done this for them previously was no longer available. This forced the new norms to come into practice (6 in Figure 3).

...People are used to just picking up the phone to someone and saying can you run this for me and you say well actually you know it's pretty easy for you to do it yourself so I will come up and show you how to run it.

(Finance Business Analyst (Retail), BrandX)

In contrast, the authoritative resources provided by SAP and its enablement of shared services changed work place norms and in the process empowered managers and users (6 in Figure 3).

I am able to get information I wasn't able to get before and I can get it without having to go to a programmer, without having to put in a request and I can get it immediately and you can download the information to a file and sort it, do whatever you want without any real problem.

(Site Manager, BrandX)

However this is not typical right across BrandX. Whereas 95% of the users in the finance area have adjusted to the new norms, in other functional areas it may be as low as 50%.

The increased accountability and visibility of users made possible by the SAP system and its use by management is an example of the way that technology constrains human action. However, users were also empowered by having access to more information and the ability to query the SAP system. This empowerment of users illustrates how the SAP system enabled human action.

Despite the very early post implementation problems BrandX has managed to gradually improve its use of the SAP system. Configuration and customisation of SAP has continued during the post implementation period with SAP experts changing the software to match

BrandX's business processes (3 in Figure 3) and BrandX managers and users taking advantage of SAP capabilities to gradually improve business processes (6 in Figure 3).

The manufacturing section within BrandX has had the most problems with the use of the SAP system. At 21 months post "go-live" one manufacturing site believed that business improvement had only come in the last few months. The largest manufacturing site did not believe its customer service levels were back where they were before the SAP implementation. The current priority at BrandX is the ongoing improvement of business processes and their alignment with SAP. However it should be noted that 21 months post "go-live" is still relatively early in the post implementation phase. The realisation of business benefits can take time to achieve with some estimates as long as four years (Deloitte Consulting, 1999).

DISCUSSION AND CONCLUSION

The structural model of technology has been used as a lens to gain a deeper understanding of the post implementation period of an ERP system in a single manufacturing organisation. It has highlighted the importance of historical and contextual factors in understanding how new organisational properties were shaped through human agency during the implementation and use of the SAP software, and existing organisational properties were reinforced and strengthened. It has also facilitated viewing the post implementation period from multiple levels of analysis, for example, the level of organisation (ManA, BrandX), group (SAP implementation team, management) and individual (user).

A number of historical and contextual factors have conspired to limit the business benefits that BrandX has achieved from its SAP system. Specific factors during the implementation process were:

- SAP may not have been the best ERP software choice (from the BrandX manufacturing perspective)
- The method of selection of members of the BrandX SAP implementation team
- The assumptions the about the BrandX businesses that the SAP consultants brought to the implementation team
- Configuration and customisation of SAP to match existing business processes
- Training conducted only prior to "go-live".

During the post implementation period they included:

- The limited nature of the available support to assist users with SAP
- The lack of ongoing training in SAP
- Limited ongoing support to work on improving business processes
- The lack of a business benefits realisation process.

The implementation of the SAP system in BrandX was viewed as a system replacement (a mainly technical perspective) with limited acknowledgment that SAP would be used within a social system. It is how users interact with a technology in their daily tasks, not the mere fact that the technology is there, that affects the business benefits gained from a technology (Orlikowski, 2000). This highlights the importance of the post implementation period and the need for ongoing quality training and support, the very resources that were limited in the post implementation period in BrandX. The fact that there was no benefits realisation process during the post implementation period is not surprising as the SAP implementation was viewed merely as a system replacement.

This study supports the findings of Ross and Vitale (2000) who reported that inadequately resourcing the post implementation phase, inadequately addressing resistance to change and the failure to establish metrics can affect the value an organisation obtains from their ERP system. A major limitation of the findings from this research is that it is a single case. Future work will involve examination of the post implementation periods of ERP systems in another three manufacturing organisations with the aim of understanding and explaining why some organisations gain more benefits than others from their ERP implementations.

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